

## Prevalence of *Schistosoma haematobium* among School Children in Al-Lamab Bahar Abiad Area, Khartoum State, Sudan 2017: A Cross Sectional Study

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### Abstract

Schistosomiasis is the one of the World Health Organization's most neglected disease. It is a major tropical and subtropical disease commonly found mainly in the developing countries. A cross sectional descriptive study was conducted to estimate the current prevalence of *S. haematobium* infection among school children aged 5 to 13 years in Al-Lamab Bahar Abiad Area, Khartoum State, Sudan between January and February 2017. A total of 300 urine samples were collected randomly and examined microscopically, while urine dipstick method was used to detect the presence of protein and blood in each urine sample. A total of 72 (24%) urine samples were positive for Schistosomiasis, 41 (13.7%) were males and 31 (10.4%) were females, P. value = 0.176. The percentage of infection among children according to their age groups; 5 - 7 years, 8 - 10 years and 11-13 years, with *S. haematobium* were 29 (40.3%), 23 (31.0%) and 20 (27.8%) respectively, P. value = 0.032. The mean of intensity varied among the different age groups, with the age group of 11-13 years showing the highest mean of intensity, with P. value=0.000. Microscopic detection of haematuria was the best indicator for the positive *S. haematobium* infection (97.2%) when compared with dipstick method (91.2%) and macro examination (77.8%). Also, the overall 72 (62.6%) infected child with urinary Schistosomiasis were from 115 participated child who had a direct contact with water, showing positive results. Microscopic haematuria can be used as a first line indicator for urinary Schistosomiasis. Health education and community participation on targeted treatment of infected patients and the use of safe water supply, sanitation, are suggested for better and improved quality of life.

**Keywords:** *S. haematobium*; Urinary Schistosomiasis; School Children; Khartoum

### Introduction

Schistosomiasis is one of WHO most neglected diseases. It is a major tropical and subtropical disease commonly found spread in many African countries and other developing countries in Asia and south America with estimated deaths of more than 200,000 annually [1]. Schistosomiasis is a group of water borne parasitic disease caused by digenetic trematode flatworms (flukes) of the genus *Schistosoma* with 3 most well-known species causing the disease: *S. haematobium*, *S. mansoni* and *S. japonicum* [2,3]. Its transmission is influenced by the presence of snail species of *Bulinus* and *Biomphalaria* serving as the intermediate host [4]. Schistosomiasis is prevalent in tropical and subtropical areas, especially in poor communities without access to safe drinking water and adequate sanitation. It is estimated that at least 90% of those requiring treatment for Schistosomiasis live in Africa [5]. Contact with contaminated freshwater is the major risk factor of infection [5]. The main group at risk is school children, while other specific occupational groups (fishermen, irrigation workers, farmers), women and other groups using infested water for domestic purposes are also considered to be at risk [6,7].

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Pathology of the Schistosomiasis also known as bilharziasis, which occurs due to immunologic reaction to *Schistosoma* eggs trapped in tissues [8,9]. Antigens released from the egg stimulate a granulomatous reaction involving T-cells, macrophage and eosinophils that results in clinical disease [10,11]. Symptoms and signs depend on the number and location of eggs trapped in the tissues. Initially, the inflammatory reaction is readily reversible [11]. In the later stages of the disease the pathology is associated with collagen deposition and fibrosis, resulting in organ damage that may be only partially reversible [9,12,13]. *S. haematobium* infection is also associated with an increased rate of bladder cancer [14]. Local tissue invasion of eggs result in the release of toxins and enzymes and provokes a TH-2-mediated immune response. In addition, immune complexes that contain worm antigens may deposit in the glomeruli leading to glomerulonephritis and amyloidosis [9,15]. *S. haematobium* causing female genital tract Schistosomiasis has been identified as a major social and medical problem that may facilitate the spread of some sexual transmitted diseases, such as HIV and HPV [16,17].

Parasitological diagnosis of *S. haematobium* infection is readily undertaken by urine concentration through centrifugation or filtration [18]. For *S. haematobium* infection, the presence of micro- or/and macro-haematuria has enabled the development and validation of a range of indirect diagnostic tests useful for epidemiological mapping of the disease prevalence, such as dipstick methods which detect micro- and macro-haematuria [19]. Simple interview methods to ascertain the history of haematuria have also been shown to be useful [20]. In this study we aimed to investigate the prevalence of *S. haematobium* infection among school children in Al-Lamab Bahar Abiad area, Khartoum state, Sudan.

## **Materials and Methods**

### **Study area and Study design**

A cross-sectional descriptive educational facility based study conducted from January to February 2017 in Al-Lamab Bahar Abiad area, Khartoum State, Sudan. The area is located in the southern part of the Khartoum capital, near the eastern shore of White Nile. The location of the area nearby the river attracts the residence to bathing, swimming, laundry, and other activities.

### **Study population**

The study population included both males and females of primary school children between the ages of 5-13 years old. A total of 300 urine samples were randomly collected from the school children. Also a pre-validated interview based questionnaire was distributed to every participating school child. Each questionnaire recorded necessary data such as age and sex. Also, other data are recorded, including the behavioral risks (water contact activities), environmental sanitation, living condition (types of water supply, latrine system, water proximity) and history of infection (treatment, clinical symptoms such as visible haematuria, dysuria, burning micturition, bladder colic). The questionnaire was conducted in a voluntary manner, without any attempt by the interviewer to influence the responses.

### **Inclusion and exclusion criteria**

Primary school children residing in the study area, aged from 5 - 13 years old were included. Any children who does not reside in the area or had taken medication for Schistosomiasis 3 weeks prior to and during the data collection time was excluded.

### **Sample collection methods**

About 10 ml of terminal urine samples were collected from each participant in well labeled, clean, wide mouthed, screw capped plastic containers. All urine samples were collected between 10:00 am and 2:00 pm to obtain high *S. haematobium* egg load. No preservative was needed because the samples were studied immediately.

### **Determination of haematuria and Proteinuria**

Samples were immediately checked macroscopically for gross haematuria by visible examination, and also screened for micro-haematuria and proteinuria using commercial reagent strip (Medi-test-combi-9, manufactured by Machery-Hagel, Duren, Germany).

### Microscopic Analysis of urine samples

Samples were analyzed using the standard sedimentation technique which has been described previously [21].

### Data analysis

All data of study population and each parameter were analyzed by using parametric (frequencies, mean, chi square) using Statistical Package for Social Science (SPSS), with significant at level (P. value < 0.05).

### Ethical consideration

This study has been approved by the Faculty of Medical Laboratory Sciences Research Committee, University of Khartoum. This study was posing no physical risk to participants through an interview of 5 minutes. Neither the participant name nor his institution was used in any of study material. Informed consents were obtained from the parents and/or guardians of the children. All the infected children were treated with 40 mg/Kg praziquantel after prescribed by the school physician.

### Results and Discussion

From a total of 300 samples examined for the presence of *S. haematobium*, 150 belonged to males and 150 belonged to females, with ages ranging between 5 to 13 years. Out of the 150 samples of males, 41 (13.7%) were found to be positives for urinary Schistosomiasis. On the other hand, 31 (10.4%) of 150 samples from the females were positive for *S. haematobium*. The overall prevalence of *S. haematobium* among the 300 collected urine samples was 24.1%. No significant difference was observed concerning the differences in gender for obtaining the infection, P. value= 0.176. Similar results were also reported by Degarege., *et al.* in 2015 [22], when assessing the prevalence of *S. haematobium* infection among school-aged children in Awash Valley, Afar Regional State, north-eastern Ethiopia by Amaechi in 2014 when studying the prevalence of the disease in some rural communities of Abia state, south eastern Nigeria [23].

Out of the 300 individuals examined for Schistosomiasis, 98 were symptomatic for Schistosomiasis infection (i.e. visible haematuria, dysuria and burning micturition). Seventy two of those symptomatic individuals showed positive results for the disease (73.5%), while 26 of them showed negative results (26.5%). Of these 72 positive patients, 68 (94.4%) showed presence of pus cells in their urine. This may be an indicator for the relationship between Schistosomiasis and urinary tract infection (retrograde infection) [7,9,24] (Table 1).

| Characteristics               | Positive | Negative | Total | P-value |
|-------------------------------|----------|----------|-------|---------|
| <b>Gender</b>                 |          |          |       |         |
| Male                          | 41       | 109      | 150   |         |
| Female                        | 31       | 119      | 150   | 0.176   |
| Symptoms Appearance           | 72       | 26       | 98    | 0.000   |
| <b>Age Groups</b>             |          |          |       |         |
| 5 - 7 Years                   | 29       | 59       | 88    |         |
| 8 - 10 Years                  | 23       | 108      | 131   |         |
| 11 - 13 Years                 | 20       | 61       | 81    | 0.032   |
| <b>Macrohaematuria</b>        |          |          |       |         |
| Positive                      | 56       | 2        | 58    |         |
| Negative                      | 16       | 226      | 242   | 0.000   |
| <b>Microhaematuria</b>        |          |          |       |         |
| Positive                      | 70       | 85       | 155   |         |
| Negative                      | 2        | 143      | 145   | 0.000   |
| <b>Haematuria by Dipstick</b> |          |          |       |         |
| Positive                      | 66       | 92       | 158   |         |
| Negative                      | 6        | 136      | 142   | 0.000   |
| <b>Proteinuria</b>            |          |          |       |         |
| Positive                      | 40       | 38       | 78    |         |
| Negative                      | 32       | 190      | 222   | 0.000   |
| Water Contact                 | 72       | 228      | 300   | 0.001   |

**Table 1:** The study participants from El-Lamab Bahr Abiad Area, Khartoum state, Sudan January to February 2017.

When illustrating the age groups with an interval of 5 - 7 years, 8 - 10 years and 11 - 13 years, the prevalence of infection with *S. haematobium* were 29 (40.3%), 23 (31.0%) and 20 (27.8%) respectively. Results were statistically significantly different, P. value = 0.032. These results showed that the most infected age group is 5 - 7 years also the variation between the groups is slightly small. This also might be as a result of the undeveloped hygiene in these groups to account for the close numbers of the infected children. Also, previous studies conducted on school children produced similar results [8,22-26].

The overall mean of intensity is considered to be low: 16.18 (considering the fact that high infection with egg load > 50 egg/10 ml of urine, moderate infection 30 - 50 egg/10 ml, and low infection < 30 egg/10 ml) (See Figure 1). The mean of intensity varied among the different age groups, with the age group of 11-13 years showing the highest mean of intensity, with P. value = 0.00 which is considered highly statistically significant, agreeing with previous reports [8,22] (Table 1).



**Figure 1:** Shows the macrohaematuria detected among the infected school children from El-Lamab Bahr Abiad Area, Khartoum state, Sudan, January to February 2017.

The results of haematuria detection using 3 different methods of detection showed variable results. Macroscopic detection of haematuria by visible examination showed prevalence of 77.8% among infected patients. Whereas the prevalence of micro-haematuria detected by dipstick method was 91.8%, the microscopic detection was 97.2%. Thus, the increased rate of haematuria detected by the microscopic study should be used as the first detection method for the infection. Proteinuria detected among the infected patients using the dipstick method showed 55.6% [19,27,28] (Figure 2).



**Figure 2:** *Schistosoma haematobium* egg detected in urine samples of infected children with urinary Schistosomiasis from El-Lamab Bahr Abiad Area, Khartoum state, Sudan, January to February 2017.

The analysis of the epidemiological data showed that the 72 (62.6%) infected children with urinary Schistosomiasis were out of 115 participating children who had a direct contact with water, revealing that the number of infected children might increase through time when more children might gravitate towards water contact activities. These results were in agreement with previous reports studied the social and activity role in *S. haematobium* infection [7,23,29-31] (see also Table 1).

### Conclusion

This study showed an epidemiological event of increased prevalence of *S. haematobium* infection in Al-Lamab Bahar Abiad area. Although the prevalence of infection in males is slightly higher than females, the difference is not significant indicating that both sexes have the same behavioral water contact activity and the intensity of infection is significantly low. Also, the high association of microscopic haematuria with infection as a first line indicator for urinary infection can be used to simplify the detection of urinary Schistosomiasis. Furthermore, an appropriate intervention by applying proper intrinsic and extrinsic prevention and control measures of health education and community participation on targeted treatment of infected school children and the use of safe water supply, sanitation, and latrines should be employed for better and improved quality of life.

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